

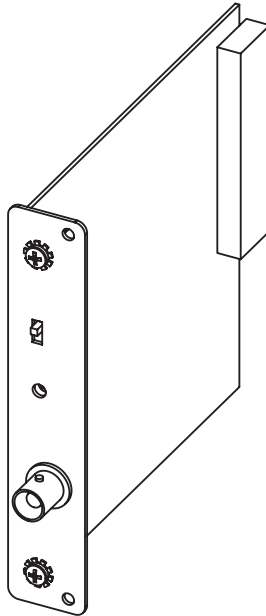
Part No. Z1-003-002, IA003082

Feb. 2008

Operation Manual

ANALOG INTERFACE
PCR-LA Series

EX03-PCR-LA



Use of Operation Manual

Please read through and understand this Operation Manual before operating the product. After reading, always keep the manual nearby so that you may refer to it as needed. When moving the product to another location, be sure to bring the manual as well.

If you find any incorrectly arranged or missing pages in this manual, they will be replaced. If the manual gets lost or soiled, a new copy can be provided for a fee. In either case, please contact Kikusui distributor/agent, and provide the “Kikusui Part No.” given on cover.

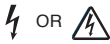
This manual has been prepared with the utmost care; however, if you have any questions, or note any errors or omissions, please contact Kikusui distributor/agent.

Reproduction and reprinting of this operation manual, whole or partially, without our permission is prohibited.

Both unit specifications and manual contents are subject to change without notice.

Safety Symbols

For the safe use and safe maintenance of this product, the following symbols are used throughout this manual and on the product. Understand the meanings of the symbols and observe the instructions they indicate (the choice of symbols used depends on the products).



Indicates that a high voltage (over 1 000 V) is used here. Touching the part causes a possibly fatal electric shock. If physical contact is required by your work, start work only after you make sure that no voltage is output here.

DANGER

Indicates an imminently hazardous situation which, if ignored, will result in death or serious injury.



Indicates a potentially hazardous situation which, if ignored, could result in death or serious injury.



Indicates a potentially hazardous situation which, if ignored, may result in damage to the product and other property.



Shows that the act indicated is prohibited.



Is placed before the sign “DANGER,” “WARNING,” or “CAUTION” to emphasize these. When this symbol is marked on the product, see the relevant sections in this manual.



Indicates a protective conductor terminal.



Indicates a chassis (frame) terminal.

Arrangement of this manual

This Operation Manual is organized as follows. A general overview of each chapter is given below.

Chapter 1 General

Gives an overview, describes the features, and specifies the part names and functions of the Analog Interface.

Chapter 2 Precautions and Preparations for Use

Describes precautions and preparations for use of the Analog Interface.

Chapter 3 Connection Method

Describes the procedure for installing the Analog Interface in a PCR-LA AC power supply.

Chapter 4 Operation Method

Describes the procedure for operating the Analog Interface and the PCR-LA AC power supply.

Chapter 5 Maintenance

Explains the procedures for maintaining the Analog Interface.

Chapter 6 Specifications

Gives the specifications for the Analog Interface.

Contents

Safety Symbols - - - - -	I
Chapter 1 General	1-1
1.1 Outline - - - - -	1-1
1.2 Features - - - - -	1-1
1.3 Part Names and Functions - - - - -	1-2
Chapter 2 Precautions and Preparations for Use	2-1
2.1 Check at Unpacking - - - - -	2-1
2.2 Handling Precautions - - - - -	2-2
2.3 Combination with Other Options - - - - -	2-2
Chapter 3 Connection Method	3-1
3.1 Product Installation - - - - -	3-1
Chapter 4 Operation Method	4-1
4.1 Outline of Operation - - - - -	4-1
4.2 Procedure - - - - -	4-2
4.3 Definition of Terms and Examples of Output Voltage Waveforms - 4-4	
4.4 Current Limit Values - - - - -	4-8
Chapter 5 Maintenance	5-1
5.1 Before Requesting a Repair - - - - -	5-1
Chapter 6 Specifications	6-1
6.1 Specifications - - - - -	6-1
6.2 Dimensions - - - - -	6-3

Gives an overview, describes the features, and specifies the part names and functions of the Analog Interface.

1.1 Outline

This product (EX03-PCR-LA) is an Analog Interface for PCR-LA Series AC Power Supplies.

Incorporating the product into a PCR-LA AC power supply allows external analog signals to be power amplified, enabling use of the PCR-LA power supply as a power amplifier.

This feature can be applied to any field, including the electrical, mechanical, and chemical industries. Specific examples include power supply environmental tests reproducing power line abnormality, a variety of immunity tests, and power amplification of output waveforms of an arbitrary signal generator.

1.2 Features

The followings are features of the EX03-PCR-LA:

Allows the PCR-LA AC power supply to be used as a power amplifier.

The amplification factor is 100 or 200. It can be fine-tuned.

Signal input terminals are electrically isolated from the output terminals of the PCR-LA AC power supply.

An isolated amplifier is used.

1.3 Part Names and Functions

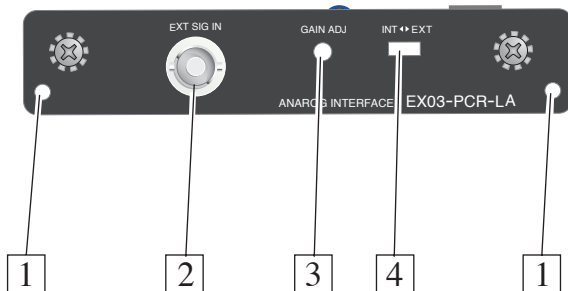


Fig.1-1 Part Names

[1] Mounting holes

Used to install the analog interface card

[2] EXT SIG IN (BNC connector)

Used to input external signals

[3] GAIN ADJ

This control is a trimmer used to fine-tune the gain (voltage amplification factor).

[4] INT/EXT switch

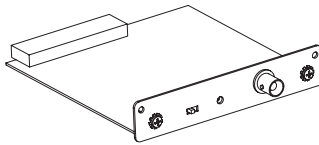
Switches between INT and EXT modes

Describes precautions and preparations for use of the Analog Interface.

2.1 Check at Unpacking

The product should be checked upon receipt for damage that might have occurred during transportation. Also check if all accessories have been provided.

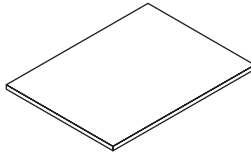
Should the product be damaged or any accessory missing, notify your Kikusui distributor/ agent.



Analog interface card (1 pc.)



Card-mounting screws (2 pcs.)
[M3-101-001]



Operation Manual (1 copy)
[Z1-003-002]

Fig.2-1 Analog Interface Card and Accessories

2.2 Handling Precautions

Handling the analog interface card

To prevent problems, always observe the following precautions when handling the analog interface card. The card's printed board is not protected.

- **Never touch any of the electronics parts installed on the printed board.**
- **Never handle the device under conditions in which static electricity may accumulate.**
- **After unpacking the carton, promptly install the interface card in a PCR-LA power supply.**
- **When storing the card, always take anti-electrostatic measures, such as storing the card in the bag in which it was packaged.**
- **Never drop the device or subject it to other impact.**
- **Do not place the device where it may be exposed to water or other liquid.**

2.3 Combination with Other Options

The Analog Interface cannot be used with other options.

Describes the procedure for installing the Analog Interface in a PCR-LA AC power supply.

3.1 Product Installation

Install the Analog Interface in SLOT3 or SLOT4 of the PCR-LA AC power supply.

■ Installing in a slot

⚠ CAUTION • Before installing the analog interface card, be sure to turn OFF the PCR-LA AC power supply's POWER switch.

1. Unscrew the screws fastening the SLOT3 or SLOT4 cover to remove the slot cover.
Save the cover in case it's needed in the future.
2. Grasp the panel part of the analog interface card.
3. Orient the card so that the parts-mounted side of the printed board is at the right. Place the printed board in the slot groove.
4. Insert the analog interface card into the far end of the slot, taking care not to allow the printed board to slip out of the groove.
5. After fully inserting the card, secure the card to the PCR-LA AC power supply using the screws provided.

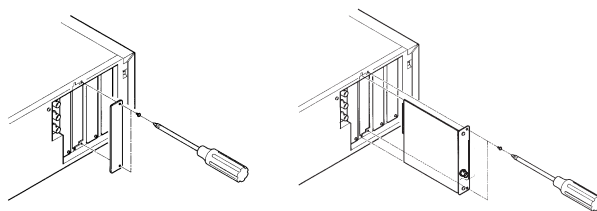


Fig.3-1 Installing the analog interface card in the slot

This completes installation of the analog interface card in a slot.

■ Connecting an external signal

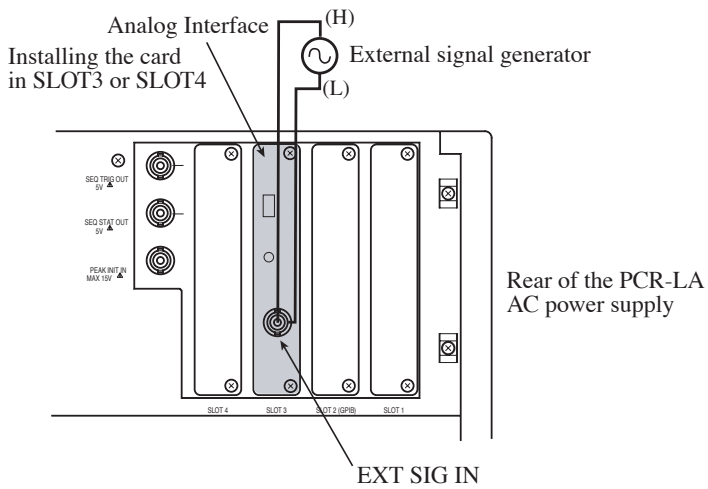


Fig.3-2 Connecting an External Signal

Describes the procedure for operating the Analog Interface and the PCR-LA AC power supply.

4.1 Outline of Operation

The following describes the operations of the Analog Interface and the PCR-LA AC power supply when external signal input is used, then explains how to return to internal signal input.

■ Functional limitations

When the Analog Interface is used in a PCR-LA AC power supply, the following power supply functions are disabled:

- Voltage, current, and frequency limit settings
- AC mode
- Memory function
- Synchronous function
- Sensing function
- The measured values of the voltmeter and ammeter are fixed to a peak value (three figures).
- LOAD level meter
- RS-232C control

NOTE

- The voltage limit value becomes the estimated maximum output voltage (see page 4-4), and the frequency limit value becomes the estimated minimum frequency (see page 4-6).
 - The output voltage mode of the PCR-LA AC power supply should be set to AC-S mode when the power supply is used as an AC amplifier, or to DC mode if it is used as a DC amplifier. For DC output on which an AC component is superimposed, select DC mode.
-

4.2 Procedure

■ Working with the Analog Interface (external signal input)

1. Turn the POWER switch of the PCR-LA AC power supply OFF.
2. Set the INT/EXT switch on the panel of the Analog Interface to EXT.

The INT/EXT-switch setting status will be detected when the POWER switch is turned ON. Note that the mode has not yet been selected when the INT/EXT switch is switched.

3. Connect an external signal (generator) to the EXT SIG IN terminal on the panel of the Analog Interface panel.

■ Operation of the PCR-LA AC

4. Turn the POWER switch of the PCR-LA AC power supply ON.

This causes the frequency display to show “AXXX” (X is a frequency set value: see the frequency setting procedure in 3.4 of the PCR-LA AC Power Supply Operation Manual).

5. Set the output voltage of the PCR-LA AC power supply to the estimated maximum output voltage (See “ * Estimated maximum output voltage”, on page 4-4.). (Set the peak value.)

NOTE • Neglecting to set the estimated maximum output voltage will result in delayed response. For more information, see “■When the estimated maximum output voltage is not set (Fig. 4-2).”

6. Set the output frequency of the PCR-LA AC power supply to the estimated minimum frequency (See “ * Estimated minimum frequency”, on page 4-6.).
7. Input an external signal via the EXT SIG IN terminal on the panel of the Analog Interface.
8. Activate the OUTPUT of the PCR-LA AC power supply.
The power supply enters output-enabled status.

-
- NOTE** • When the power switch is turned off, the estimated maximum output voltage, the estimated minimum frequency, the output voltage mode and the output voltage range will be the following settings.

Estimated maximum output voltage:	0 V
Estimated minimum frequency:	50 Hz
Output voltage mode:	AC-S
Output voltage range:	100 V

■ Fine-tuning an amplification factor

1. Operate GAIN ADJ on the panel of the Analog Interface to obtain the desired amplification factor. The amplification factor can be varied across a range of approximately $\pm 20\%$.

■ Returning to internal signal input

1. Turn the POWER switch of the PCR-LA AC power supply OFF.
2. Set the INT/EXT switch on the panel of the Analog Interface to INT.
3. Turn the POWER switch of the PCR-LA AC power supply ON.

The INT/EXT switch setting status will be detected when the POWER switch is turned ON. Note that the mode has not yet been selected when the INT/EXT switch is switched.

4.3 Definition of Terms and Examples of Output Voltage Waveforms

* Estimated maximum output voltage

This is the maximum estimated output voltage value (peak value) (intended to be output).

-
- NOTE**
- If the output voltage exceeds the estimated maximum output voltage, the peak part of the output voltage waveform is distorted (clipped) for a short time. When the output voltage becomes constant after a certain length of time has elapsed, a normal waveform is attained several hundred ms later.
 - If the output voltage is less than the estimated maximum output voltage, the rated output current in some cases will be limited (output voltage is distorted). In particular, if the difference between the output voltage and the estimated maximum output voltage is large and continues for several seconds, OVERLAOD (alarm No. 3) or the internal overheat protection (alarm No. 2) will be tripped.
-

- NOTE**
- If an alarm is generated, turn the POWER switch of the PCR-LA AC power supply OFF. Eliminate the cause of the alarm, then turn the POWER switch ON. For more information, see section 4.6, Protective Functions in the PCR-LA AC Power Supply Operation Manual.
-

- CAUTION**
- Do not attempt to output a voltage exceeding the rated maximum output voltage (peak value) of the PCR-LA AC power supply. To avoid doing so, use the input voltage within the external signal input voltage range.
 - Rated maximum output voltage (peak value): $212 V_{\text{peak}}/424 V_{\text{peak}}$ (output range of 100 V/200 V)
 - Do not output a voltage exceeding the allowable input voltage of a load. Otherwise, the load may be burned.
 - Frequent tripping of a protective function may lead to problems.
-

Examples of output voltage waveforms

■ When the estimated maximum output voltage is set (Fig. 4-1)

For cases (b) and (c) in Fig. 4-1, the waveform may be distorted. The extent of the distortion depends on the ratio of V_{op}/V_s , the output current waveform, and other factors. If the state specified in (c) continues for several seconds, an alarm may occur.

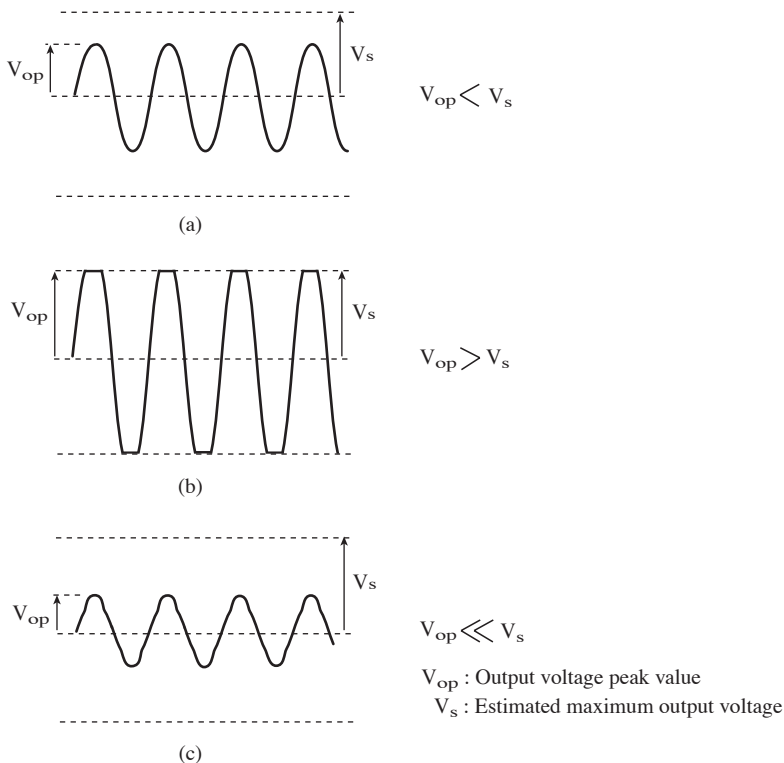
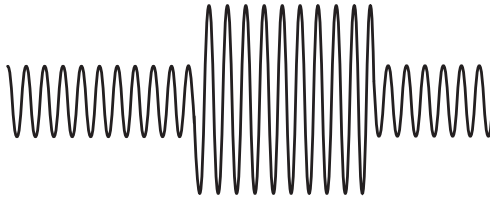


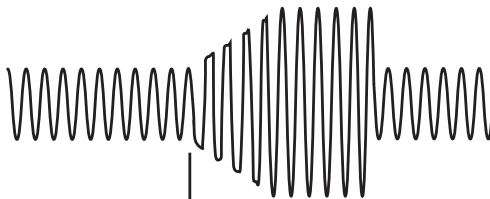
Fig.4-1 When the estimated maximum output voltage is set

■ When the estimated maximum output voltage is not set (Fig. 4-2)

In Fig. 4-2, (a) indicates an input signal and (b) shows the output voltage. For the output voltage, a response delay of several hundred ms in relation to the input voltage occurs. When $V_{op} > V_s$, a normal waveform is attained several hundred ms later.



(a) Input signal



(b) Output voltage

Several hundred ms

Fig.4-2 When the estimated maximum output voltage is not set

* Estimated minimum frequency

This is the minimum estimated frequency value (intended to be output).

NOTE

- The rated output current is a value corresponding to the set frequency (estimated minimum frequency). (For more information, see the specifications for the PCR-LA AC power supply.)

If the output frequency is less than the estimated minimum frequency, the output voltage may be distorted.

-
- ⚠ CAUTION** • Do not attempt to output a frequency exceeding the rated maximum output frequency of the PCR-LA AC power supply.
- Rated maximum output frequency: 999.9 Hz (fundamental frequency with a total harmonic distortion factor of 10 % or less)
 - If the frequency exceeds the rated maximum output frequency, the protective function will trip, which may cause the output voltage to drop (the waveform to distort).
 - Frequent tripping of a protective function may lead to problems.
-

If output frequency f_o is less than the estimated minimum frequency f_s :

The waveform may be distorted. The degree of distortion depends on the ratio of f_o/f_s , output voltage, current, waveform, and other factors.

If output frequency f_o is higher than the rated maximum output frequency f_{omax} :

The waveform may be distorted. The degree of distortion depends on the ratio of f_o/f_{omax} , output voltage, current, waveform, and other factors.

Fig. 4-3 shows the relationship between the available frequency and the input voltage. Refer to this as a guide, not a guaranteed performance characteristic.

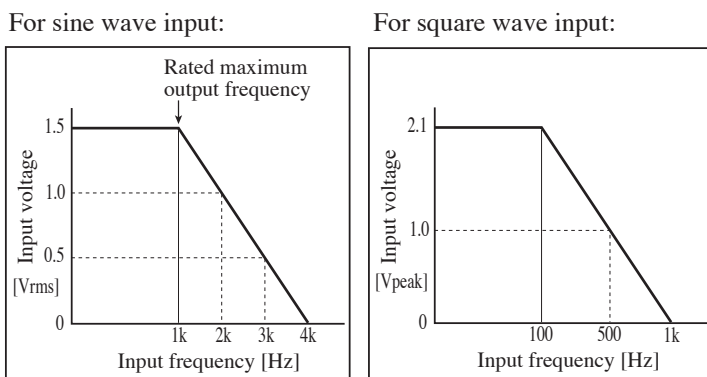


Fig.4-3 Relationship Between Available Frequency and Input Voltage

4.4 Current Limit Values

The current limit value applied for external signal input (when the INT/EXT switch on the panel of the Analog Interface has been set to EXT) is set to the maximum current of the PCR-LA AC power supply. For more information, see 4.2.3, Current Limit Value, and 4.6.2, Lighting of “ALARM” Involving an Overload, in the PCR-LA AC Power Supply Operation Manual.

-
- NOTE** • For external signal input (when the INT/EXT switch on the panel of the Analog Interface has been set to EXT), the current limit function is tripped by detecting the mean value of the output current.
-

Explains the procedures for maintaining the Analog Interface.

5.1 Before Requesting a Repair

If a problem arises in the EX03-PCR-LA, first refer to Table 5-1. Disconnect the Analog Interface from the PCR-LA PC power supply and check whether the power supply alone operates normally. If normal status cannot be restored, contact your Kikusui distributor/agent to request repairs.

Table 5-1 Troubleshooting

Problem	Check items	Judgment	Remedies
A waveform differing from that of the external input signal is output.	Check whether the most significant digit of the frequency display on the PCR-LA AC power supply is "A."	NO	Turn the POWER switch of the PCR-LA power supply OFF, then set the INT/EXT switch of the Analog Interface to EXT.
Output voltage waveform distorted	Check whether the estimated maximum output voltage has been set in EXT mode.	NO	Set the estimated maximum output voltage.
	Check whether a voltage exceeding the estimated maximum output voltage is output.	YES	Set the estimated maximum output voltage above the actual output voltage.
	Check whether a frequency falling the estimated minimum frequency is output.	YES	Set the estimated minimum frequency below the actual output frequency.
	Check whether a frequency exceeding the rated maximum output frequency of the PCR-LA AC power supply is output.	YES	Use the PCR-LA AC power supply at a frequency below the rated maximum output frequency.

Alarm (No. 1) generated	Check whether a voltage exceeding the rated maximum output voltage (peak value) of the PCR-LA AC power supply is output.	YES	Use the PCR-LA AC power supply at a voltage below the rated maximum output voltage.
Alarm (No. 3) generated	Check whether the difference between the estimated maximum output voltage and the output voltage is large. Check whether the estimated maximum output voltage is too high.	YES	Set the estimated maximum output voltage as close to the actual output voltage as possible.
Alarm (No. 2) generated	Check whether the difference between the estimated maximum output voltage and the output voltage is large. Check whether the estimated maximum output voltage is too high.	YES	Set the estimated maximum output voltage as close to the actual output voltage as possible.
	Check whether the external signal input voltage range is exceeded.	YES	Set the external signal input voltage within the range given in the specifications.

Gives the specifications for the Analog Interface.

6.1 Specifications

The following specifications specify the comprehensive performance achieved when the Analog Interface is installed in the PCR-LA AC power supply. Other specifications not given here comply with those for the PCR-LA AC power supply.

Input section

External signal input voltage range	Nominal value: 0 to $\pm 2.12 V_{\text{peak}}$ (0 to 1.5 V _{rms} sine wave) when the voltage amplification factor is set to 100/200 (100 V/200 V range). Maximum tolerance: $\pm 5 V_{\text{peak}}$
External signal input frequency range	DC/1 Hz to 1 kHz sine waves (with 10 % distortion or less) 1 Hz to 100 Hz square waves (in the external signal input voltage range)
External signal input impedance	10 k Ω \pm 10 % (unbalanced)

Output section (output of the PCR-LA AC power supply)

Rated maximum output frequency	999.9 Hz (fundamental frequency with total harmonic distortion of 10% or less)
Voltage amplification factor	100 V range: 100 \pm 10 % 200 V range: 200 \pm 10 % Variable range: \pm 20 % (or greater) in relation to 100 or 200
Frequency characteristics	DC to 5 kHz (-3 dB) with respect to 200 Hz (On input of a sine wave of 0.5 Vrms or less)
Output voltage distortion factor	Specifications for the PCR-LA AC power supply +0.5 % or less (0.1% or less at sine wave input)
Output voltage rise and fall time	Specifications for the PCR-LA AC power supply +50 μ s (typical value) (On input change of 0 V to 2 V and vice versa)
Output voltage temperature coefficient	Specifications for the PCR-LA AC power supply +200 ppm/ $^{\circ}$ C (typical value)

General specifications

Insulation resistance	500 V DC, 30 M Ω (external signal terminal to chassis, external signal terminal to input, external signal terminal to output)
Withstand voltage	500 V AC for 1 minute (external signal terminal to chassis, external signal terminal to input, external signal terminal to output)
Voltmeter	Three-digit display, specifications for the PCR-LA AC power supply +3% (typical value), peak display only
Ammeter	Three-digit display, specifications for the PCR-LA AC power supply +5% (typical value), peak display only
Frequency meter	Three-digit display, without measurement function (set value display only)

- External signal input terminal (EXT SIG IN): BNC connector
- Switching between external input and internal action (EXT/INT): Slide switch
- Gain control (GAIN ADJ): Semi-fixed trimmer

6.2 Dimensions

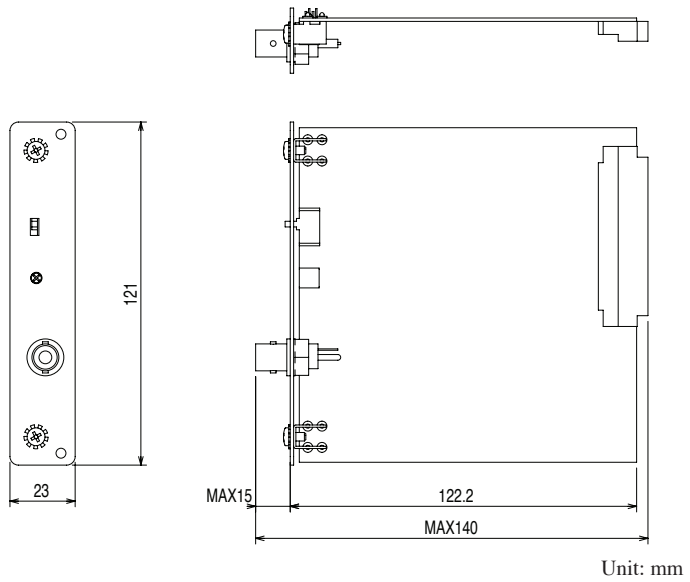
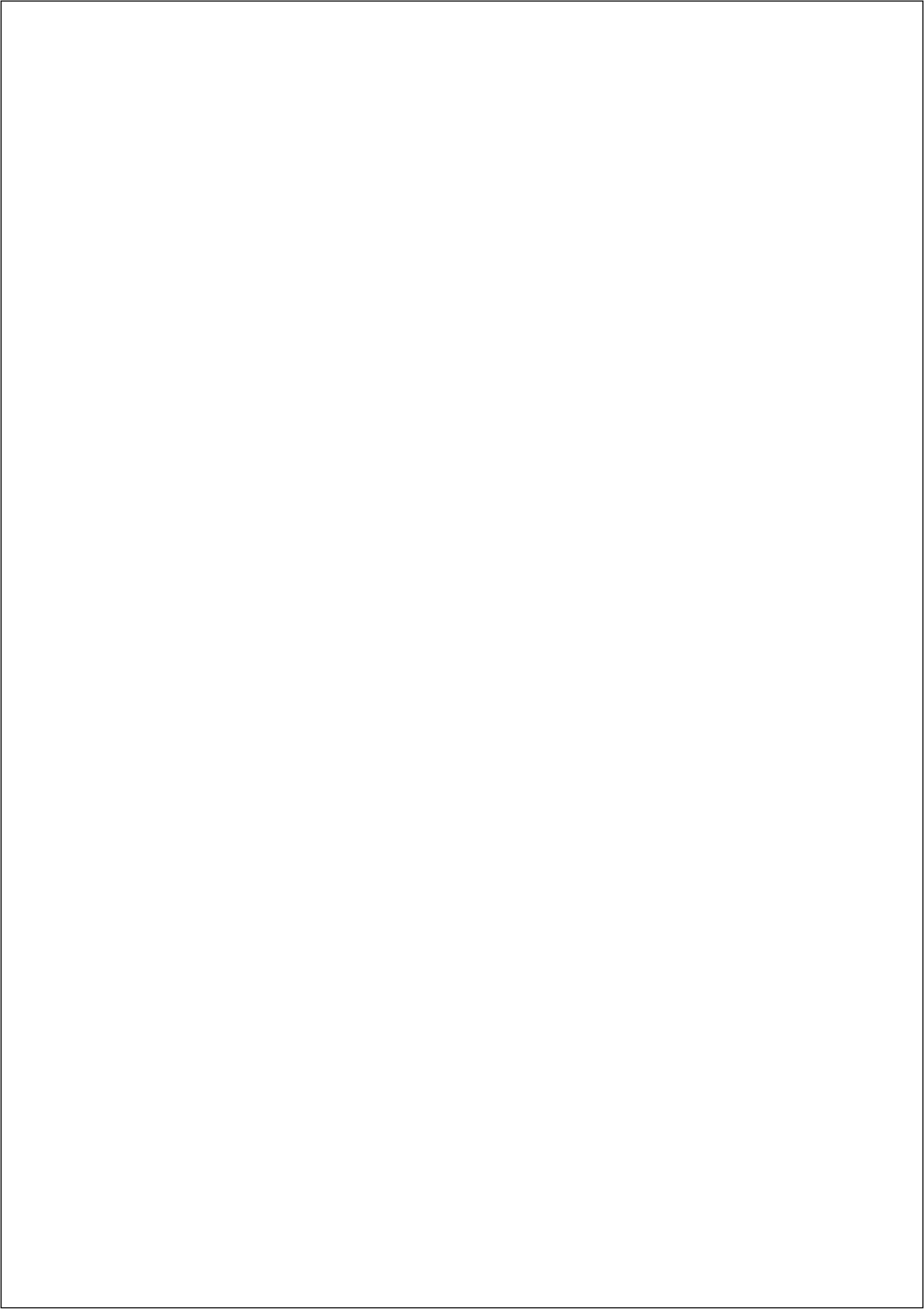


Fig.6-1 EX03-PCR-LA



ANALOG INTERFACE

EX03-PCR-LA

OPERATION MANUAL